

Metallic Joining to Advanced Ceramic Composites, Phase I

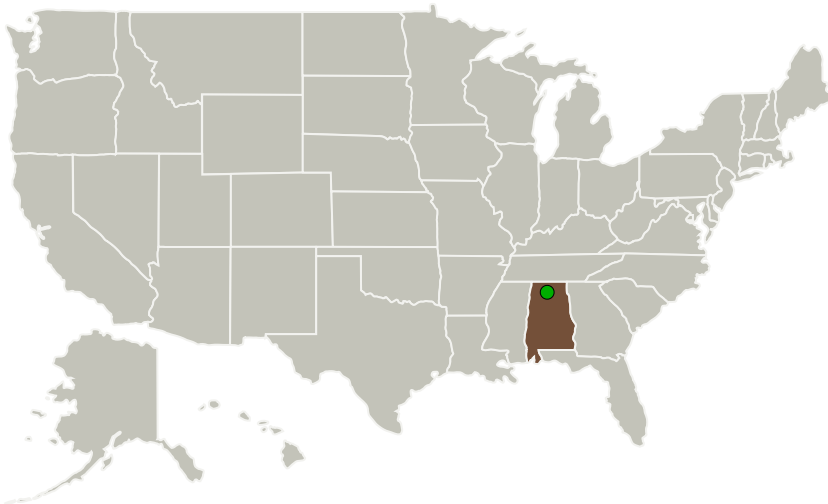
Completed Technology Project (2015 - 2015)



Project Introduction

Currently, advanced ceramic composites are state-of-the-art for hypersonic airbreathing and space propulsion applications. The Launch Abort System (LAS) of the Orion Multi-Crew Exploration Vehicle (MCEV) will provide a safe escape for the crew in the event of an emergency during launch. A key component of the LAS is its Attitude Control Motor (ACM) containing numerous advanced ceramic composite subcomponents. To fully utilize the high specific strengths and temperature capabilities of these composites, reliable high-temperature joining techniques are needed for attachment to metallic structures. Typical joining technologies such as epoxy, brazing and soldering are not useful in high-temperature applications. Currently, pintles and hot structures are mechanically fastened through highly stressed joints to metallic rods and actuators. Mechanical fastening is not an ideal solution since it causes stress concentrations and destruction of continuous fibers by through holes and threads reducing the mechanical properties of the composite structure. A solution that will resolve joining of numerous composites to metallic components is being pursued. During Phase I, techniques to join metallic structures to advanced ceramic composites will be investigated resulting in structural qualification testing for the ACM pintle assembly. During Phase II, ACM hot gas components will be fabricated and hot fire tested.

Primary U.S. Work Locations and Key Partners



Metallic Joining to Advanced Ceramic Composites, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Transitions	2
Images	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	2
Target Destinations	3

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Metallic Joining to Advanced Ceramic Composites, Phase I

Completed Technology Project (2015 - 2015)



Organizations Performing Work	Role	Type	Location
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Project Transitions

**June 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Metallic Joining to Advanced Ceramic Composites, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139087>)

Images

**Briefing Chart Image**

Metallic Joining to Advanced Ceramic Composites, Phase I
(<https://techport.nasa.gov/image/135649>)

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

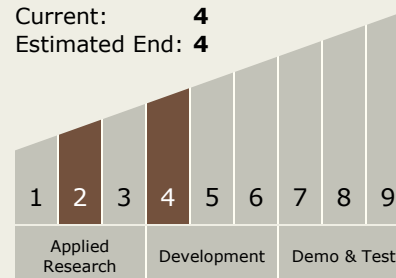
Timothy N Mckechnie

Co-Investigator:

Timothy Mckechnie

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.1 Lightweight Structural Materials

Metallic Joining to Advanced Ceramic Composites, Phase I

Completed Technology Project (2015 - 2015)



Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System